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03/13/00

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S. L. A. MODIANO*

Milano, March 7, 2000

New US Application in the name of
Mario BERETTA

Agent's Docket: 33330/GM/vp

Hon.

COMMISSIONER OF PATENTS AND TRADEMARKS

WASHINGTON D.C. 20231

U. S. A.

Transmitted herewith are the following papers for filing a new Application:

1. Specification and claims; Declaration/Power of Attorney duly signed March 3, 2000 and attached thereto;
2. Two Drawings on strong paper accompanying the specification (M.P.E.P. 608.02-rev. 81);
3. Deposit Account order for Filing Fee : \$ 345 dated March 7, 2000 (duplicate);
4. Deposit Account order for Assignment fee : \$ 40 dated March 7, 2000
5. Assignment of the Invention to: TENAX S.p.A.
6. Small Entity verified Statement.

The priority of the here-under listed Application(s) is respectfully claimed:

- Italian Application No. MI99A000714 filed April 7, 1999
- Italian Application No. filed

A Certified Copy of the priority Application(s) ~~will be sent in due course~~ is attached.

Please place of record in the file the enclosed papers and kindly acknowledge receipt thereof; please readily collect the credit specified in the Deposit Account order, so as to allow the Application to receive the earliest possible filing date, within:

APRIL 7, 2000

Respectfully submitted

Guido MODIANO
(Reg. No. 19,928)

Encls.:

- Spec./claims + Declaration/Power
- Formal drawings (Two)
- Filing Fee Dep. Acc. order (duplicate)
- Assignment + Fee dep. Acc. order
- Certified Copy
- Small Entity verified Statement

THE COMMISSIONER OF PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the Patent Application of:

SMALL ENTITY

Inventor(s): Mario BERETTA

For: **NET-LIKE STRUCTURE PARTICULARLY FOR GEOTECHNICAL USES**

Enclosed are:

XX Small Entity verified Statement.

XX Two sheets of drawing on strong paper (M.P.E.P. 608.02 – rev. 81)

XX An Assignment of the Invention to **TENAX S.p.A.**

XX A Certified Copy of an Italian Patent Application

☐ Associate Power of Attorney

| CLAIMS AS FILED | | | | |
|--------------------|---------------------|---------------------|------------------|---------------------------|
| (1) for | (2) number filed | (3) number extra | (4) rate | (5) basic fee \$ 345.= |
| Total claims | 10 - 20 = | | x \$ 9.= | |
| Independent claims | 1 - 3 = | | x \$ 39.= | |
| | | | Total filing fee | \$ 345.= |

XX Please charge my Deposit Account No. 13-3860 in the amount of \$ 345.=.
A duplicate copy of this sheet is enclosed

XX The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Account No. 13-3860.
A duplicate of this sheet is enclosed.

☐ A check in the amount of _____ to cover the filing fee is enclosed.

Milan, Italy
March 7, 2000



Guido MODIANO
(Reg. No. 19,928)

VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c))--SMALL BUSINESS CONCERN

Docket Number (Optional):
33330/GM/vp

Applicant or Patentee: Mario BERETTA

Application or Patent No.: _____

Filing Date or Issue Date: _____

Title: NET-LIKE STRUCTURE PARTICULARLY FOR GEOTECHNICAL USES

I hereby declare that I am

☐ the owner of the small business concern identified below:

☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN TENAX S.p.A.

ADDRESS OF SMALL BUSINESS CONCERN Via dell'Industria 3 - 23897 VIGANO' -
ITALY

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:

☒ the specification filed herewith with title as listed above.

☐ the application identified above.

☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention must file separate verified statements averring to their status as small entities, and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization having any rights in the invention is listed below:

☒ No such person, concern, or organization exists.

☐ Each such person, concern or organization is listed below:

Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Mario BERETTA

TITLE OF PERSON IF OTHER THAN OWNER President of the Board of Directors

ADDRESS OF PERSONS SIGNING Via Pineta 21 - 23896 SIRTORI - ITALY

SIGNATURE 

DATE March 3, 2000

A P P L I C A T I O N

F O R

U N I T E D S T A T E S O F A M E R I C A

* * * * *

S P E C I F I C A T I O N

T O A L L W H O M I T M A Y C O N C E R N :

B e i t k n o w n t h a t I ,

Mario BERETTA
o f S I R T O R I – I T A L Y

I t a l i a n c i t i z e n

h a v e i n v e n t e d c e r t a i n i m p r o v e m e n t s i n

**“NET-LIKE STRUCTURE PARTICULARLY FOR GEOTECHNICAL
USES”**

o f w h i c h t h e f o l l o w i n g d e s c r i p t i o n i n c o n n e c t i o n w i t h t h e a c c o m p a n y i n g
d r a w i n g s i s a s p e c i f i c a t i o n , l i k e r e f e r e n c e c h a r a c t e r s o n t h e d r a w i n g s
i n d i c a t i n g l i k e p a r t s i n t h e s e v e r a l f i g u r e s .

BACKGROUND OF THE INVENTION

The present invention relates to a net-like structure particularly for geotechnical uses.

It is known that geotechnical applications currently use perforated sheets or grids which are appropriately calendered or thermoformed so as to have protrusions or studs on their surface; another solution entails manufacturing nets with two or more sets of yarns or optionally manufacturing grid-like products which have, on one face, a plurality of spacer studs which have a free end.

The products according to the prior art are not always up to their tasks, since for example continuous or perforated sheets shaped by calendering or molding have the drawback that they are fragile and easily compressible due to the internal weakness of the resulting protrusions.

It is not advisable to use such sheets as draining products due to the excessive presence of relatively large spacing materials, which are furthermore subjected to gradual compression under stress, so that the studs ultimately become compressed and decrease in thickness, consequently reducing the drainage capacity.

If fabrics are coupled to conventional products, since the studs are relatively spaced, the geotextile product sinks in the points where it is not bonded.

Another problem is that the calendering of grid-like or perforated material can be performed only starting from material which has small openings, in order to avoid compromising the strength of the structure and its production, accordingly reducing the drainage capacity of the product.

When using two or more layers of yarns, the draining function is rendered less efficient by the presence of transverse yarns along the path of the fluid which in practice hinder the free flow of liquids.

Furthermore, the products according to the prior art, when not bonded to membranes and/or fabrics, due to their nonlaminar structure, may damage or

bite into delicate surfaces such as those of the linings or membranes that are superimposed thereon.

When using grid-like products with studs, such studs, when subjected to intense compression, can perforate the delicate surfaces with which they are
5 in contact.

SUMMARY OF THE INVENTION

The aim of the invention is to eliminate the above drawbacks, by providing a net-like structure particularly for geotechnical applications which has spacer elements having excellent resistance to compression
10 without however having large cross-sections which may hinder the useful passage sections between the two faces of the structure.

Within the scope of this aim, an object of the invention is to provide a product which can be used advantageously both in spacing and in drainage systems.

15 Another object of the present invention is to provide a net-like structure which avoids the possibility of damage to the surrounding surfaces and furthermore allows stable connection to any geotextile layers connected in large regions of the net-like structure.

Another object of the present invention is to provide a net-like structure
20 which thanks to its particular constructive characteristics is capable of giving the greatest assurances of reliability and safety in use and is also competitive from a purely economical point of view.

This aim, these objects and others which will become apparent hereinafter are achieved by a net-like structure particularly for geotechnical
25 applications, according to the invention, comprising a first and a second layer which are spaced one another and joined by spacers which are co-extruded together with said layers, at least one of said layers being constituted by at least one set of yarns arranged at one end of said spacers.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Further characteristics and advantages will become apparent from the

description of preferred but not exclusive embodiments of a net-like structure particularly for geotechnical applications, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic perspective view of a net-like structure according to the present invention in which the two layers are both formed by a set of
5 yarns;

Figure 2 is a perspective view of the net-like structure according to the invention, with a layer formed by a grid-like element;

Figure 3 is a view of a net-like structure with both layers formed by
10 means of grid-like elements;

Figure 4 is a view of a net-like structure with one layer formed by a sheet-like element;

Figure 5 is a schematic view of the bonding of a geotextile element to the net-like structure.

15 **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

With reference to the above figures, the net-like structure particularly for geotechnical applications according to the invention comprises a first layer, generally designated by the reference numeral 1, and a second layer, generally designated by the reference numeral 2, which are spaced one
20 another and joined by spacers 3 which are co-extruded with such layers.

The solution idea that is the basis of the invention is to provide spacers 3 which have a reduced cross-section, have a variable shape according to the intended applications and join the two layers 1,2 so as to give the structure used as a spacer a resistance to compression which is proportionate to the
25 pressure applied thereto, obtaining, in drainage systems, high-level drainage properties which remain unchanged even when the product is subjected to compression.

The types of the layers can be provided in various manner; thus, for example, as shown in Figure 1, both layers 1,2 are provided by means of a
30 first set of yarns, designated by the reference numeral 10, which are

arranged in a parallel configuration on the various layers and are arranged in directions which are mutually substantially parallel for the sets of each individual layer 1,2 and transverse with respect to the set of yarns provided on the other layer 1,2.

5 According to Figure 2, one of the layers, for example the first one 1, is formed by means of a grid-like element, designated by the reference numeral 20, from which the spacers 3 protrude, connecting the other layer 2, which is constituted by a set of yarns again designated by the reference numeral 10.

10 The spacers 3, which are constituted by studs, can be provided at the nodes of the grid-like structure or optionally at any point of the grid-like element, without altering the fact that the studs must end in the yarns that constitute the second layer 2.

The spacers 3 can have a variable cross-section according to the application and to the pressures to which they are subjected.

15 Figure 3 illustrates a structure in which the first layer 1 is provided by means of the grid-like element 20 and the second layer 2 is provided by means of a second grid-like element 21; in this case also, the two grid-like elements are joined by studs which can be distributed both at the nodes or crossing points of the grid-like elements 20 and at any other point.

20 One of the layers, for example the first one 1, as shown in Figure 4, can be provided by means of a sheet-like element 30 from which the studs 3 protrude and merge into the second layer 2, which is constituted for example by a set of yarns.

25 Openings 31 can be formed on the sheet-like element 30, thus forming in practice an open structure which considerably facilitates drainage, or the sheet-like element can be devoid of openings if an impermeable surface is required.

The resulting structure allows to easily bond geotextile fabrics, 30 designated by the reference numeral 40, significantly increasing the contact

surface, which provides a more stable bonding of the geotextile and the structure; sagging of the fabric that does not undergo the process of inclusion between the studs is thus avoided, and the drainage and filtration properties of the structure are left unchanged.

5 It is also possible to apply two layers of fabric or a layer of fabric and a layer of lining.

The presence of two layers of yarns spaced one another makes the structure very solid from a mechanical viewpoint, avoiding deformation or damage to the product, but on the other hand allows the structure to easily
10 adapt to the surfaces to which it is applied, by the fact that the structure is relatively soft.

The studs used have dimensions and shapes which can vary according to the applications for which the product is intended without altering the fact that the connection provided between the two layers considerably increases
15 resistance to compression and avoids the folding of the studs.

The net-like structure also allows, thanks to a stud which has a reduced horizontal cross-section and a height which can vary according to requirements, to achieve the passage of liquids and gases without forming an obstacle to their drainage in a longitudinal and transverse direction.

20 The studs, as already mentioned, can be arranged in various manners according to requirements and applications, as the extrusion system allows to provide a higher or lower density of studs and it is possible to arrange the studs at the nodes or junctions of the meshes of the grid-like elements or along the yarns thereof.

25 In particular, the arrangement of the stud at the intersection of the yarns is provided when one wishes to ensure higher compression resistance of the structure.

From the above description it is thus evident that the invention achieves the intended aim and objects, and in particular the fact is stressed that the
30 net-like structure according to the invention can be used effectively in

systems designed to provide protection, spacing and high drainage.

Furthermore, the net-like structure according to the invention, both in the case of the grid-like form and in the case of the continuous or perforated membrane, can be shaped and folded easily while maintaining a high concentration of studs; this allows to use a high-performance product even in the presence of nonlinear surfaces where a high degree of adhesion is required.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

Thus, for example, the shape of the yarns and their concentration can vary according to the specific use for which the structure is meant; the yarn can be flat or flattened in shape where it is necessary to bond fabric and the number of yarns can be increased where required.

All the details may furthermore be replaced with other technically equivalent elements.

The disclosures in Italian Patent Application No. MI99A000714 from which this application claims priority are incorporated herein by reference.

WHAT IS CLAIMED IS:

1. A net-like structure particularly for geotechnical applications, comprising a first and a second layer which are spaced one another and joined by spacers which are co-extruded together with said layers, at least
5 one of said layers being constituted by at least one set of yarns arranged at one end of said spacers.

2. The net-like structure according to claim 1, wherein both said first and second layers are formed by a first set of yarns which are mutually parallel on one respective of the layers and mutually transverse between said layers,
10 said spacers having ends located respectively at the yarns of one layer and at said yarns of another layer.

3. The net-like structure according to claim 1, wherein at least one of said first and second layers is formed by means of a grid-like element.

4. The net-like structure according to claim 3, wherein said spacers lie at
15 nodes of said grid-like element.

5. The net-like structure according to claim 3, wherein said spacers protrude from any point of the yarns that constitute said grid-like element.

6. The net-like structure according to claim 3, wherein said grid-like element is formed by two sets of yarns which mutually intersect.

20 7. The net-like structure according to claim 1, wherein both said first and second layers are formed by a grid-like element.

8. The net-like structure according to claim 1, wherein one of said first and second layers is constituted by a sheet-like element from which said spacers protrude.

25 9. The net-like structure according to claim 8, further comprising through openings in said sheet-like element.

10. The net-like structure according to claim 1, comprising a geotextile fabric which is associated with at least one of said first and second layers.

ABSTRACT OF THE DISCLOSURE

A net-like structure particularly for geotechnical applications which comprises a first and a second layer which are mutually spaced and joined
5 one another by spacers which are co-extruded together with the layers. At least one of the layers comprises at least one set of yarns arranged at one end of the spacers; the spacers have a reduced transverse cross-section.

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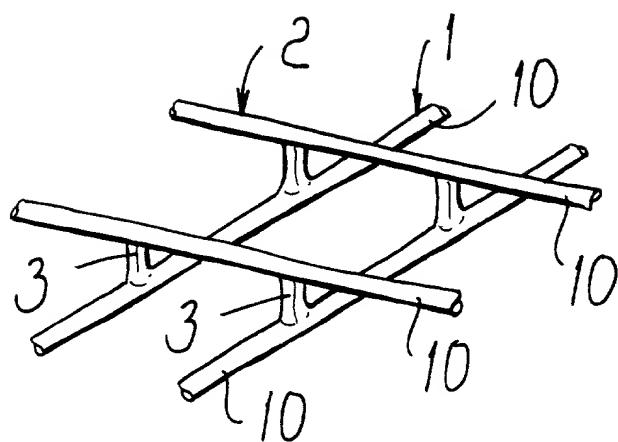


Fig. 1

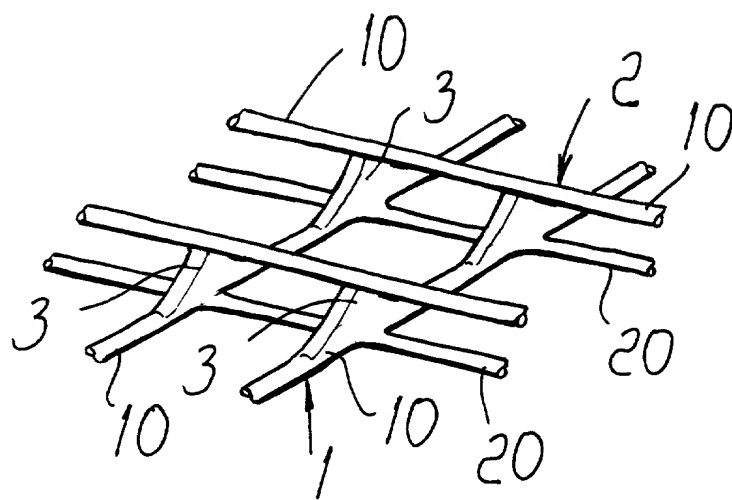


Fig. 2

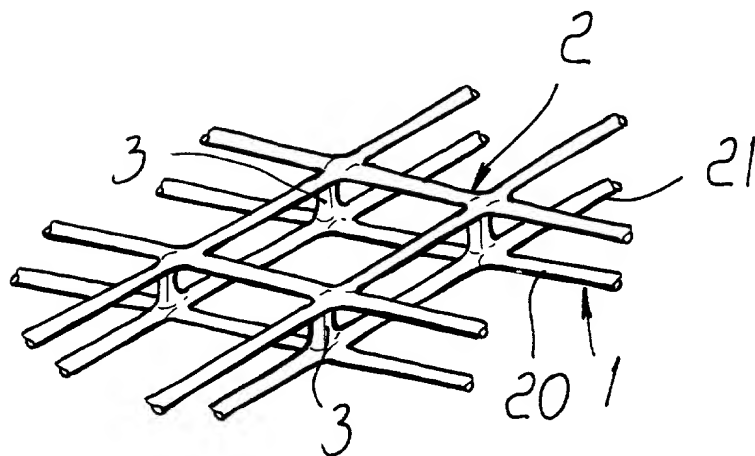


Fig. 3

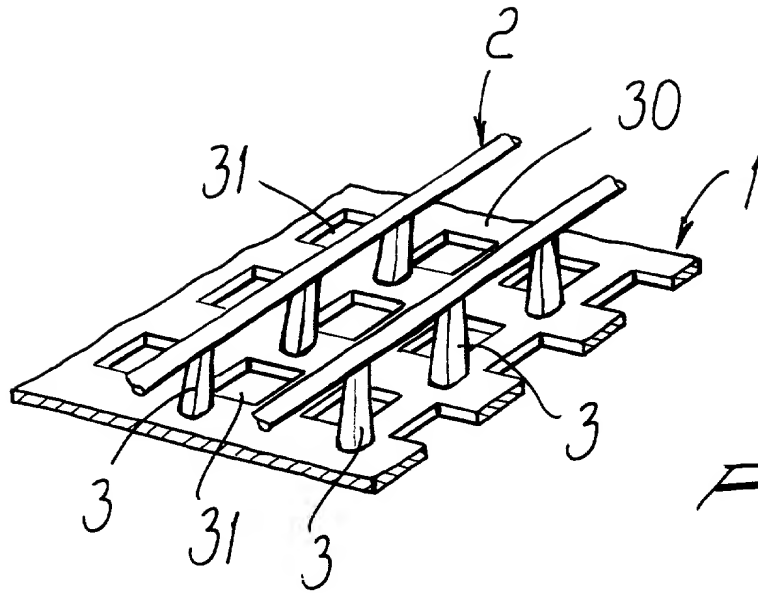


FIG. 4

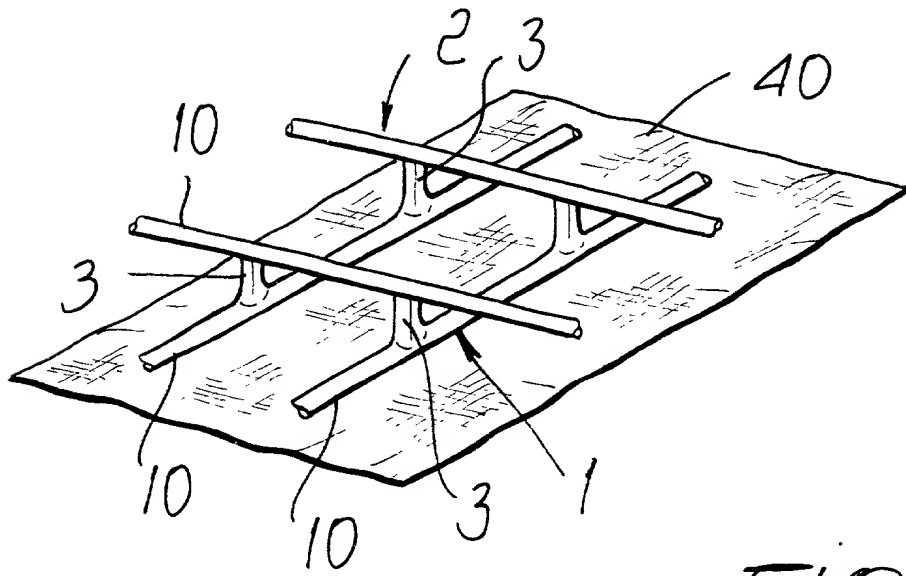


FIG. 5

Declaration and Power of Attorney for patent Application

Dichiarazione e procura ai fini della domanda di brevetto

Italian Language Declaration Docket No.: 33330/GM/vp

Il sottoscritto inventore dichiara che:

La propria residenza, recapito postale e cittadinanza corrispondono a quanto indicato in calce, sotto la propria firma.

Ritiene di essere il primo ed unico inventore originale (se viene elencato in calce un solo nominativo) o il coinventore primo ed originale (se è elencato più di un nominativo) del oggetto rivendicato e per il quale il sottoscritto presenta domanda di brevetto. La invenzione in questione è chiamata

STRUTTURA DEL TIPO RETE,

PARTICOLARMENTE PER USI GEOTECNICI

e la sua descrizione è allegata alla presente Dichiarazione a meno che non sia spuntata la seguente casella:

- ☐ Il _____
è stata depositata una domanda di brevetto
statunitense numero o una domanda di brevetto
internazionale PCT numero _____
che è stata modificata il _____
(se applicabile).

Il sottoscritto dichiara in oltre di aver letto e compreso il contenuto della descrizione identificata in precedenza, rivendicazioni comprese, come modificati dall'eventuale modifica summenzionata.

Il sottoscritto riconosce l'obbligo di rivelare informazioni essenziali ai fini della determinazione della brevettabilità ai sensi del Titolo 37, Codice dei Regolamenti Federali, §1.56.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

NET-LIKE STRUCTURE PARTICULARLY FOR

GEOTECHNICAL USES

the specification of which is attached hereto unless the following box is checked:

- ☐ was filed on _____
as United States Application Number or PCT
International Application Number _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

Italian Language Declaration

Il sottoscritto rivendico con la presente la priorità prevista dal Titolo 35, Codice degli Stati Uniti, § 119(e)-(d) o § 365(a) in relazione a qualsiasi domanda o domande estere di brevetto o certificato di inventore, o dal Titolo 35, § 365(a) degli stessi Codice in relazione a qualsiasi domanda internazionale PCT nella quale è designato almeno un paese diverso dagli Stati Uniti, I suddetti domande e certificati essendo elencati sotto, e, spuntando le seguenti caselle, ha anche identificato sotto qualsiasi domanda estera di brevetto o certificato di inventore, o domanda internazionale PCT, la cui data di deposito preceda quella della domanda per la quale è rivendicata la proprietà.

Prior foreign application(s)

Domande Estere Anteriori

MI99A000714

ITALY (ITALIA)

(Number)
(Numero)

(Country)
(Nazione)

(Number)
(Numero)

(Country)
(Nazione)

Il sottoscritto rivendica con la presente i benefici previsti dal Titolo 35, Codici degli Stati Uniti, § 119(e), in relazione a qualsiasi domanda o domande provvisorie degli Stati Uniti elencate sotto.

(Application No.)
(N° della domanda)

(Filing Date)
(Data di deposito)

(Application No.)
(N° della domanda)

(Filing Date)
(Data di deposito)

Il sottoscritto rivendica con la presente i benefici previsti dal Titolo 35, Codice degli Stati Uniti, § 120, in relazione a qualsiasi domanda o domande statunitensi, o dal Titolo 35, § 365(c) degli stessi Codice in relazione a qualsiasi domanda internazionale PCT nella quale sono designati gli Stati Uniti, I suddette domande essendo elencate sotto e, nella misura in cui l'oggetto di ciascuna rivendicazione di questa domanda non sia stato esposto nella domanda statunitense o internazionale PCT anteriore nel modo previsto dal primo paragrafo del Titolo 35, Codice degli Stati Uniti, § 112, riconosce l'obbligo di rivelare informazioni essenziali ai fini della determinazione della brevettabilità ai sensi del Titolo 37, Codici dei Regolamenti Federali, § 156, le quali diventino disponibili durante il periodo compreso tra la data di deposito della domanda anteriore e la data di deposito nazionale o internazionale PCT della presente domanda.

(Application No.)
(N° della domanda)

(Filing Date)
(Data di deposito)

(Application No.)
(N° della domanda)

(Filing Date)
(Data di deposito)

Con la presente, il sottoscritto dichiara veritiere tutte le affermazioni contenute in questa domanda in relazione alle proprie conoscenze e di ritenere vere tutte le affermazioni o informazioni presentate. Dichiara inoltre che tali asserzioni sono state espresse nella piena consapevolezza che le dichiarazioni intenzionalmente false sono punibili con una multa, l'incarcerazione o entrambe, ai sensi della Sezione 1001 del Titolo 18 del Codice degli Stati Uniti e che tali dichiarazioni intenzionalmente false possono mettere a repentaglio la validità della domanda o di qualsiasi brevetto rilasciato in merito.

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventors certificate or PCT International application having a filing date before that of the application on which priority is claimed:

Priority not claimed

Diritto di priorità non rivendicato

7 APRIL 1999 (7.4.1999)

(Day/Month/Year Filed)
(Giorno, Mese/Anno di deposito)

☐

(Day/Month/Year Filed)
(Giorno, Mese/Anno di deposito)

☐

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Status) (patented, pending, abandoned)
(Stato) (concessione de brevetto, in corso di esame, abbandono)

(Status) (patented, pending, abandoned)
(Stato) (concessione de brevetto, in corso di esame, abbandono)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Italian Language Declaration

PROCURA: Io, sottoscritto inventore, nomino con la presente il seguente avvocato o avvocati e/o agente o agenti al fine di istruire questa pratica e di condurre tutte le operazioni ad essa pertinenti presso l'Ufficio dei Brevetti e Marchi di Fabbrica: *(Elencare il nome ed il numero di matricola)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: *(list name and registration number)*

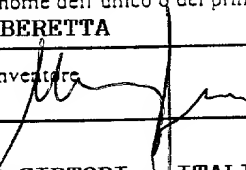
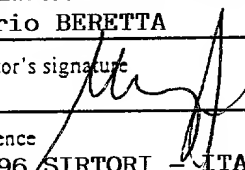
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| Firma del secondo inventore _____ Data _____ | Inventor's signature _____ Date _____ |
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(Fornire le stesse informazioni e le firme del terzo e degli ulteriori coinventori.)

(Supply similar information and signature for third and sub-sequent joint inventors.)